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Curtis A. Esche and Jensen H. Groff, Column Editors

Introduction

The Proficiency Analytical Testing (PAT) Program is a collaborative effort of the American Industrial Hygiene Association (AIHA) and researchers at the Centers for Disease Control and Prevention, National Institute for Occupational Safety and Health. The PAT Program provides quality control reference samples to over 1300 occupational health and environmental laboratories in 18 countries. Although one objective of the PAT Program is to evaluate the analytical ability of participating laboratories, the primary objective is to assist these laboratories in improving their laboratory performance.

Each calendar quarter (designated as a round), samples are mailed to participating laboratories and the data are analyzed to evaluate laboratory performance on a series of analyses. Each mailing and subsequent data analysis is completed in time for participants to obtain repeat samples and correct analytical problems before the next calendar quarter starts. The PAT Program currently includes four sets of samples, as shown in Table 1. A mixture of three of the four possible metals and one to three of the ten possible organic solvents are rotated for each round. Fibers alternate between amosite and chrysotile asbestos and man-made fibers; no fiber mixtures are provided. Each set consists of four concentrations and a blank. The metal, silica, and fiber samples are on filters and the organic solvents are on charcoal or silica gel tubes. The organic solvent set also includes five blank charcoal or silica gel tubes for desorption efficiency determination.

Laboratories are evaluated for each analysis by comparing their reported results against an acceptable performance limit for each PAT Program sample the laboratory analyzes. Reference laboratories are preselected to provide the performance limits for each sample. These reference laboratories must meet the following criteria: (1) the laboratory was rated proficient in the last PAT evaluation of all the contaminants in the program; and (2) the laboratory, if located in the United States, is AIHA accredited. After the data from the reference laboratories are collected and statistically treated, the mean of the collected data is called the reference value and the performance limits equal the mean ± 3 standard deviations. Data are acceptable if they fall within the performance limits. Data falling outside the performance limits are reported as outliers.

TABLE 1. Current Sets of Samples in the PAT Program

Metals	Silica	Fibers (Phase Contrast Microscopy Fiber Counting)	Organic Solvents
Cadmium	Quartz	Amosite	Benzene
Chromium		Chrysotile	Chloroform
Lead		Man-made fibers	1,2-Dichloroethane
Zinc			Methanol
			p-Dioxane
			Tetrachloroethylene
			Toluene
			1,1,1-Trichloroethane
			Trichloroethylene
			o-Xylene

Laboratories are rated based upon performance in the PAT Program over the last year (i.e., four calendar quarters), as well as on individual contaminant performance. Individual contaminants are metals, silica, asbestos/fibers, and organic solvents. Individual contaminant performance is rated as (1) proficient if all results have been reported and all are classified as acceptable for the last two consecutive rounds; and (2) proficient in all other cases if three-fourths or more of the results reported in the last four consecutive rounds are classified as acceptable.[1]

PAT Round 125, April 1996

A total of 1330 laboratories were enrolled in the PAT Program, with 1201 laboratories submitting results for round 125. Table 2 presents the summary of the PAT proficiency ratings for each analytical area. Table 3 lists the reference values, performance limits, and participants for each sample type in the PAT Program.

New organic solvents will be introduced into the PAT program. Methyl ethyl ketone and methyl isobutyl ketone will appear in round 128 (January 1997), followed by ethyl acetate, *n*-butyl acetate, and isopropanol in round 130 (July 1997). Also, there will be one man-made fiber sample included with every asbestos/fibers kit. Laboratories will be instructed to use the "A" rules when counting man-made fibers for statistical reasons.

PAT Round 126, July 1996

PAT round 126 was sent to participating laboratories on July 1, 1996. The organic solvents in this round were benzene, *o*-xylene, and toluene. Metals in this round included cadmium, chromium, and lead.

TABLE 2. PAT Proficiency Ratings Based upon Rounds 122 to 125 (July 1995–June 1996)

Contaminant	No. of Labs Rated	No. of Labs Rated Proficient	Percent of Labs Rated Proficient
Metals	357	339	95.0
Silica	83	82	98.8
Asbestos/fibers	1018	973	95.6
Organic solvents	319	284	89.0

TABLE 3. Reference Values, Performance Limits, and Participants for Each Sample Type; PAT Round 125 (April 1996)

Contaminant	Sample Number	No. of Reference Labs	Reference Value	RSD (%)	Performance Limits	No. of Labs	No. of Outliers
Cadmium (mg)	1	57	0.0085	3.8	0.0075–0.0095	359	39
	2	57	0.0141	4.0	0.0125–0.0158	359	29
	3	57	0.0056	4.7	0.0049–0.0064	359	22
	4	57	0.0114	4.3	0.0100–0.0129	359	23
Lead (mg)	1	57	0.0631	3.6	0.0562–0.0700	364	26
	2	57	0.0195	4.9	0.0166–0.0223	364	32
	3	57	0.0834	3.6	0.0745–0.0924	364	25
	4	57	0.0482	4.4	0.0419–0.0545	364	24
Zinc (mg)	1	57	0.1792	4.4	0.1555–0.2028	357	25
	2	57	0.0722	5.2	0.0608–0.0836	357	29
	3	57	0.1328	4.4	0.1154–0.1502	357	27
	4	57	0.0953	4.3	0.0830–0.1075	357	28
Silica (mg)	1	57	0.1018	20.5	0.0392–0.1645	83	4
	2	57	0.0676	21.4	0.0242–0.1110	83	2
	3	57	0.1013	20.2	0.0398–0.1627	83	5
	4	57	0.0566	24.8	0.0144–0.0987	83	2
Asbestos/fibers (f/mm^2)	1	57	391	29.9	119–820	1018	51
	2	57	191	30.7	55–407	1018	49
	3	57	247	38.7	43–618	1018	21
	4	57	227	31.7	63–495	1018	46
Methanol (mg)	1	57	0.9540	7.7	0.7343–1.1736	319	19
	2	57	0.1312	7.6	0.1015–0.1610	319	34
	3	57	0.4450	5.8	0.3672–0.5229	319	31
	4	57	0.7634	6.6	0.6133–0.9135	319	22

Silica had a talc background and asbestos/fibers were amosite with one man-made fiber sample. Round 126 was the first practice round for passive monitors. Monitors were obtained from three different manufacturers and the organic solvents used were benzene, *o*-xylene, and toluene. Results from the practice round will be published in a future column.

References

1. Esche, C.A.; Groff, J.H.; Schlecht, P.C.; Shulman, S.A.: Laboratory Evaluations and Performance Reports for the Proficiency Analytical Testing (PAT) and Environmental Lead Proficiency Analytical Testing (ELPAT) Programs. DHHS (NIOSH) Pub. No. 95-104. National Institute for Occupational Safety and Health, Cincinnati, OH (1994).